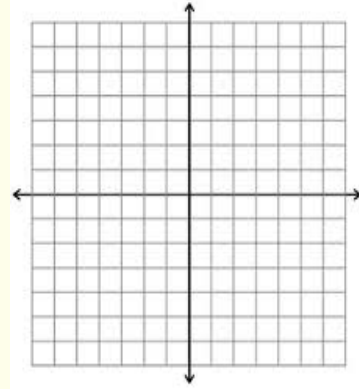


### Calculus Warm Up #8-4

1. What is the value of  $e$ ?
2. Graph on the same set of axes and describe:

$$y = e^x \quad \text{and} \quad y = \ln x$$



3. Solve:

$$e^{-2x} = e^5$$

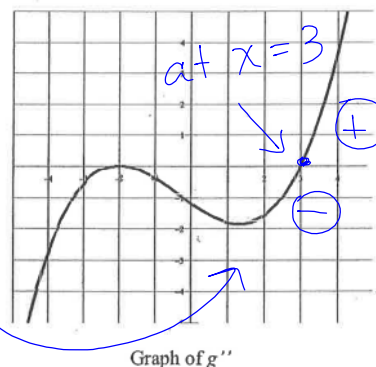
### Back of the Salmon AP practice:

III. Below is the graph of the *second* derivative of  $g$ . Use the graph to answer the following questions on the interval  $[-4, 4]$ .

1. Where is  $g$  concave down? Concave up? Justify your answer.
2. Where does  $g$  have points of inflection? Justify your answer.
3. Suppose that  $g'(0) = 0$ . Is  $g$  increasing or decreasing at  $x = 2$ ? Justify your answer.
4. Where does  $g$  have a local minimum? Justify your answer.

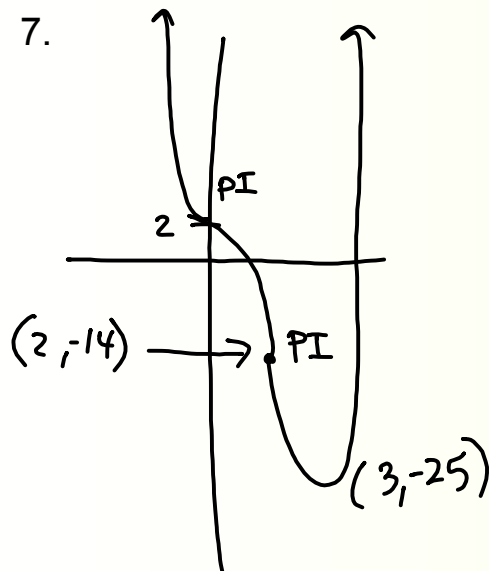
slopes of  $g'$   
are  $g''$   
so look for  $g''$  going from  
- to +

where slopes  
go from - to +



## Yellow Classwork Ch. 4

7.



8. 15 ft. by 30 ft.

Multiple Choice:

1. C

2. E

3. C

4. E

Free Response:

5.  $c = 0, \pm \approx 2.029$ 6a)  $c \approx 0.595$ 

## Yellow Classwork Ch. 4

1. Which of the following functions satisfy the hypotheses of Rolle's Theorem on the interval  $[0, 2]$ ?

I  $f(x) = \frac{1}{|x - 1|}$

II  $f(x) = |x - 1|$

III  $f(x) = x^2 - 2x$

(A) I only

(B) II only

(C) III only

(D) II and III

(E) I, II, and III

2. Which of the following functions satisfy the hypotheses of the Mean Value Theorem on the interval  $[0, 2]$ ?

I  $f(x) = \sin \pi x + \cos 2x$

II  $f(x) = \sqrt[3]{x-8}$

III  $f(x) = |x^2 - 2x|$

(A) I only

(B) II only

(C) III only

(D) I and II

(E) I, II, and III

3. How many values of  $c$  satisfy the conclusion of the Mean Value Theorem for  $f(x) = x^3 + 1$  on the interval  $[-1, 1]$ ?

(A) 0

(B) 1

(C) 2

(D) 3

(E) 4

4. How many values of  $c$  are guaranteed by Rolle's Theorem for the function  $f(x) = \frac{\sin x}{x}$  on the interval  $[-10, 10]$ ?
- (A) 4  
 (B) 5  
 (C) 6  
 (D) 7  
 (E) The theorem does not apply.

### Free-Response Questions

A graphing calculator is required for some questions.

5. Find the value(s) of  $c$  guaranteed by Rolle's Theorem for  $f(x) = x \sin x$  on the interval  $[-3, 3]$ .

$f$  cont. on  $[-3, 3]$   
 $f$  diff on  $(-3, 3)$   
 $f(-3) = f(3) \approx 0.423$

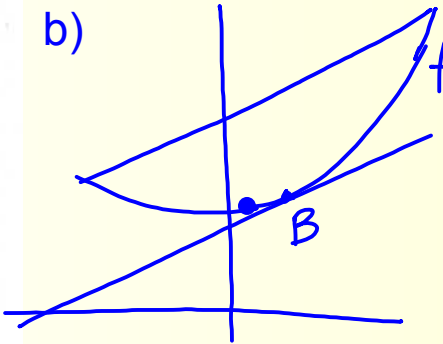
$$f'(c) = 0$$



$$c = 0, \pm \approx 2.029$$

6. (a) Find the value of  $c$  guaranteed by the Mean Value Theorem for  $f(x) = e^x - x$  on the interval  $[-2, 2]$ .
- (b) Using the DRAW menu on the calculator ((2nd) DRAW 5: Tangent), draw a line tangent to the graph of  $f(x) = e^x - x$  at the value of  $c$  found in part (a). Then go to ((2nd) DRAW 2: Line, and draw a line joining  $(-2, f(-2))$  and  $(2, f(2))$ .
- (c) Write a sentence describing the tangent line and the line joining the endpoints of the curve.

b)



$$a) \frac{f(2) - f(-2)}{2 - (-2)} \quad Y_1: f(x)$$

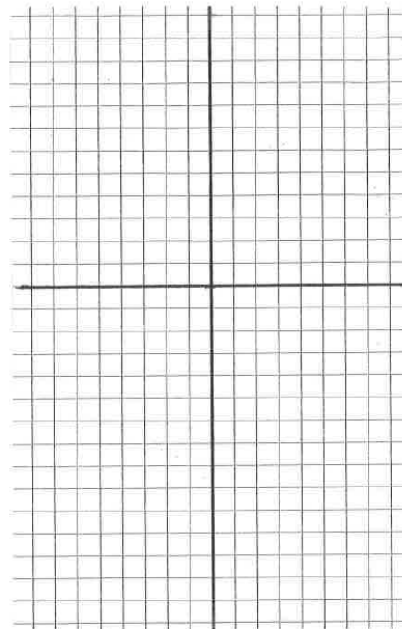
$$\quad \quad \quad Y_2: f'(x) \quad \text{MATH} \quad \text{nDeriv}(Y_1, X, X)$$

$$\quad \quad \quad Y_3: A$$

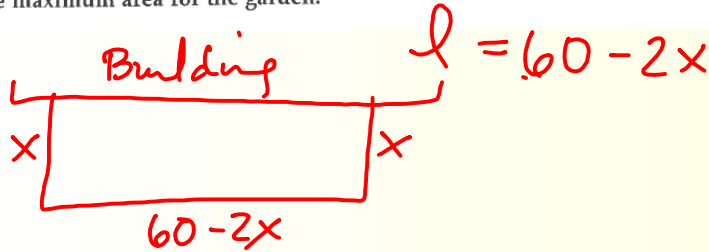
$\downarrow$   
 $\approx 0.813$   
 $\text{STO} \rightarrow A$

(Turn off  $Y_1$  and calculate the intersection, B)

7. Sketch the graph of  $f(x) = x^4 - 4x^3 + 2$ . Use the first and second derivatives to find any maxima, minima, and points of inflection. Indicate these points clearly on the graph.



8. A rectangular vegetable garden is to be enclosed using the wall of a building as one side and 60 feet of fencing on the other three sides. Find the dimensions of the rectangle that will give the maximum area for the garden.



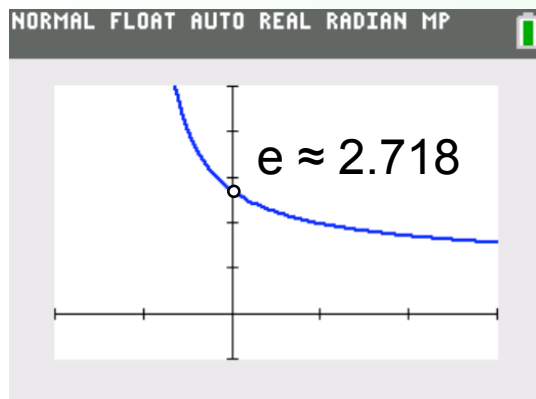
$$A(x) = x(60 - 2x)$$

$$A(x) = -2x^2 + 60x$$

The definition of  $e$ : (The natural base.)

$$\lim_{x \rightarrow 0} (1 + x)^{1/x}$$

Graph of  $y = (1 + x)^{1/x}$



| NORMAL FLOAT AUTO<br>PRESS + FOR $\Delta$ Tb1 |        |
|-----------------------------------------------|--------|
| X                                             | Y1     |
| -.05                                          | 2.7895 |
| -.04                                          | 2.7747 |
| -.03                                          | 2.7602 |
| -.02                                          | 2.746  |
| -.01                                          | 2.732  |
| 0                                             | ERROR  |
| .01                                           | 2.7048 |
| .02                                           | 2.6916 |
| .03                                           | 2.6786 |
| .04                                           | 2.6658 |
| .05                                           | 2.6533 |

X = -.05

Get out WS #2 and compare with your new team! Due turned in tomorrow.

**HW: AP Worksheet #3**  
(due turned in on Monday)